EVALUATION OF SEVERITY AND TREATMENT NEED USING OCCLUSAL & IOTN INDICES IN COIMBATORE POPULATION

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CERTIFICATE

This is to certify that this dissertation titled **"EVALUATION OF SEVERITY AND TREATMENT NEED USING OCCLUSAL & IOTN INDICES IN COIMBATORE POPULATION"** is a bonafide research of work done by **Dr. A. S. APROS KANNA.** Under my guidance during his postgraduate study period between 2009-2012.

This dissertation is submitted to THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY, in partial fulfilment for the degree of Master of Dental Surgery in Branch V-Orthodontics.

It has not been submitted (partially or fully) for the award of any other degree or diploma.

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LIST OF ABBREVIATIONS

AC	-	Aesthetic component
DAI	-	Dental Aesthetic Index
DHC	-	Dental Health Component
EF	-	Eismann Index
EI	-	Eismann –Farcnik Index
FDI COCSTOC	-	Federation Dentaire International Commission On Classification and statistics for oral conditions
HLD	-	Handicapping Labio-Lingual Deviation
HMAR	-	Handicapping Malocclusion Assessment Record
ICON	-	Index of Complexity, Outcome and Need
IOTN	-	Index of Orthodontic Treatment Need
MI	-	Malalignment Index
MSE	-	Malocclusion Severity Estimate
OFI	-	Occlusal Feature Index
OI	-	Occlusal Index
PAR	-	Peer Assessment Rating Index
Swe NBH	-	Swedish National Board of Health
TPI	-	Treatment Priority Index
WHO	-	World Health Organisation

CONTENTS

Prevalence of malocclusion now occurs in a majority of the population and shows lots of variations among different population. Malocclusion denotes any deviation from the normal or ideal occlusion. It is not just an invariable disease state, but a continuous spectrum of occlusion variation, occuring as a myriad of combinations, and the problem creating a particular manifestation of occlusion among the various population groups. Profit[68] indicated that the present prevalence of malocclusion is several times greater than it was only a few hundred years ago. A good method of recording or measuring malocclusion is important for documentation of the prevalence and severity of malocclusion in population groups. Several methods have been used to assess the prevalence of malocclusion in populations.

Early methods of recording malocclusions were qualitative and used for epidemiological studies. For example Angle in 1899 brilliantly perceived that malocclusions could be meaningfully classified in to three groups and these methods identified only the presence or absence of malocclusion .Later it was realized that qualitative methods of classification are not suitable for measuring the severity and treatment need. Quantitative Methods of recording and measuring occlusal features are important for epidemiologists and for those planning the provision of orthodontic services in a certain community. Epidemiological studies on malocclusion have been primarily concerned with its aetiology and distribution. Entrenched in these studies is the typological concept that suggests that all variants from a specified normal are abnormal[94]. The major flaw in this concept is that it is not easy to define normality, due to the fact that there always exists degrees of natural variation among individuals of a population[2]. As a result several quantitative systems to assess malocclusion for evaluating severity,

treatment need, treatment complexity, and treatment outcome have been developed in the last 50 years, with the name of indices.

Indices are systems of procedures that generate and summarize data about the malocclusions and quantify them in to a numeric value. According to VANDER LINDEN[95] index is defined, as a relative or arbitrary system of measurement used to describe or quantify a condition.

The Occlusal Index (OI), presented by Summers[80] in 1971, include nine characteristics, which are assessed for patients in both Mixed dentition as well as permanent dentition. According to Summers a basic defect is defined as a constant occlusal dysfunction that exists before, during and after the development of the occlusion. Occlusal disorders may consist of either a basic defect or a symptom of developmental change, and for an index to be valid during that time, it must concentrate on, and be sensitive to the basic defect and not the symptoms as a result. Summers, suggested that an index should be "valid over time" & the scoring for the occlusal disorder should either remain the same or increase with time, indicating that the disorder is the same or getting worse. The score should not decrease with time, as this would indicate that the occlusal disorder is self-correcting.

In 1989 peter H. Brook and William C.Shaw[12] developed an index with two components to record orthodontic treatment priority (IOTN). The first of these components records need for treatment on dental health and functional grounds,the second component records the aesthetic impairment. This is one of the first index which involved both objective and subjective assessment and given appropriate weight . These

indices have been developed with the intention of categorizing malocclusion into various groups, and scoring them for severity. Individuals with greatest scores will be prioritized for orthodontic treatment.

The main advantages of these indices are simple and accurate for quantifying malocclusions for a given population. Even though these indices have been developed from two different population, these indices have been applied widely for quantifying malocclusions for severity and treatment need elsewhere in the world.

The purpose of this study is to assess the objective and subjective levels of severity and orthodontic treatment need in Coimbatore population using OCCLUSAL and IOTN indices.

The classification of static, morphologic occlusion has been of interest to dentistry for at least a century. Arguably, Angle's classification is the most widely used and accepted occlusal classification system.

Dewey (1915) [21] noted that because the first maxillary molar is just as liable as any other tooth to assume an abnormal position, classification should be based on the antero-posterior relation of the arches as a whole rather than only the first molars. He introduced three types of sub-classifications to Class I malocclusion.

Simon (1932) [75] developed his gnathostatic system which related the dentition to the cranium in the three dimensions of space. While this was advanced for his time, acceptance of his method was hampered by the complexity of the equipment and the high degree of precision required. This concept of three-dimensional orientation of the dentition to the cranium is the forerunner to modern day gnathology.

Massler and Frankel (1951) [58] made the initial attempt to develop a quantitative method of assessing malocclusion. In this "Index of Tooth Position", the total number of displaced or rotated teeth was the basis for the evaluation of prevalence and incidence of malocclusion in population groups. Assessment was based on individual teeth as units of occlusion rather than on arch segments. Tooth displacement, rotation, infra-occlusion and supra-occlusion were recorded. The number of maloccluded teeth was summed up to give an overall measure of malocclusion.

Van Kirk and Pennell (1959) [93] proposed the Malalignment Index (MI), which involved the grading of tooth displacement and rotation. This index examined the arches in isolation, with each arch divided into three segments. They quantitatively defined two malocclusion traits: tooth displacement and rotation, the scores of which were summed up to give a full-mouth index.

Draker (1960) [22] the Handicapping Labio-Lingual Deviations (HLD) Index was developed, the index was composed of twelve features that were weighted and then summed up to provide a score. This index was proposed to complement, and perhaps substitute clinical judgement when screening subjects with handicapping anomalies.

Grainger (1960) [32] the malocclusion severity estimate (MSE) was developed. The MSE score was that of the syndrome with the largest value, regardless of the scores of the other syndromes. When the validity of the MSE was tested according to aesthetics, function, and treatment difficulty, it was found to be highly reproducible. However, there are possible shortcomings to this index, namely:

(1) The index was derived from data of 12 year-old patients and therefore might not be valid for earlier stages of dental development in the deciduous and mixed dentitions;

(2) The MSE score did not reflect all the measurements that were made and

(3) The absence of any occlusal disorder was not scored as zero.

Poulton and Aaronson (1961) [67] the Occlusal Feature Index (OFI) proposed and it was developed to measure malocclusion in population studies. The index was based on four primary features of occlusion considered to be of importance in orthodontic

examination, namely, lower anterior crowding, cuspal interdigitation, overbite, and overjet. Scores were allocated for specific deviations from normal for each criterion and summed to give an overall index within the range 0-9, with zero denoting normal occlusion.

Ballard and Wayman (1964) [5] introduced the British Standard Classification of Malocclusion that described incisal relationship. It has however been found to have poor reliability and gives no indication of treatment need.

Björk et al (1964) [11] introduced a system of registration of malocclusion for epidemiological purposes. This system defined symptoms based on three main features, namely; anomalies in the dentition, occlusion and space conditions which were objectively recorded thus facilitating direct computer analysis of the data. The advantage of this principle of registration is that any malocclusion may be described in terms of a combination of well-defined single symptoms within these three groups. Although an indication of the need for treatment is included in this registration.

Björk et al. (1964)[27] acknowledged that this item cannot be recorded objectively in the same way as that of the occlusal traits and would therefore have to be based on individual estimates.

Grainger (1967) [32] later revised the MSE and called it the Treatment Priority Index (TPI). He described the TPI as a method of assessing the severity of the most common types of malocclusion, and hence, providing a means of ranking patients according to the severity of malocclusion, the degree of handicap, or their priority of treatment. This index

defined seven natural groupings of malocclusions which tended to occur jointly and which were referred to as "syndromes". These included unacceptable aesthetics, significant reduction in masticatory function, traumatic condition predisposing to tissue destruction, speech impairment, unstable occlusion and gross or traumatic defects. Subjects were scored according to the syndrome observed with normalities scored as zero.

Salzmann (1968)[73] developed the Handicapping Malocclusion Assessment Record (HMAR). The purpose of this was to provide a means for establishing priority for treatment of handicapping malocclusions. He defined handicapping malocclusion and handicapping dentofacial deformity as conditions that constitute a hazard to the maintenance of oral health and interfere with the well-being of the patient by adversely affecting dentofacial aesthetics, mandibular function, or speech. A cut-off point was set according to the gold standard established by orthodontists from various parts of the United States.

Ackerman and Proffit (1969)[3] included occlusal alignment, profile and soft tissue in their classification scheme. In addition to describing malocclusion in three planes of space.

Hermanson and Grewe (1970)[38] tested the precision and bias of five malocclusion indices including HMAR, the OI, the TPI, and two other indices. Their results showed that only the OI and the TPI demonstrated non-significant inter-examiner variability at the 1%level, and that the most precise and unbiased index would be the OI

Summers (1971) [80] the Occlusal Index (OI), presented this index scores nine characteristics at different stages of dental development. These characteristics include dental age, molar relationship, overjet, overbite, posterior crossbite, posterior open bite, actual and potential tooth displacement, midline deviations and missing permanent maxillary incisors. Like the TPI, this index is adjusted for normality, so that the absence of any occlusal disorder is scored as zero.

Grewe and Hagan (1972) [34] tested the precision or chance of error and the bias or systemic error of three malocclusion indices like HMAR, TPI, OI. Of the three indices tested in this study, no one index can be selected over other, with regard to precision or inter- examiner differences. But the OI would be the index of choice with regard to having the least amount of bias, as indicated by the results.

Summers (1972) [81] tested the validity of three indices the CHAMPUS index used by the office for the Civilian Health and Medical Program of the Uniformed Service, the HMAR, and the OI. The OI was found to be the most valid among the three indices. when validity during time was tested, decreased scores were noted in the CHAMPUS index and the HMAR but not in the OI.

Gray and Dermirjian (1977) [33] compared the reproducibility and accuracy of four indices the HLDI, the TPI, the OI, and the HMAR. The results showed that all methods were highly reproducible, but the OI had the best correlation with clinical standard, Which was determined by subjective assessment of orthodontists.

Bezroukov (1979) [10] and co-workers presented the results of collaboration between the World Health Organisation (WHO) and the FDI and proposed the WHO/FDI method of recording occlusal traits. The primary objective of the index was to determine prevalence of malocclusion and dental irregularities as well as to estimate the treatment needs of a population, as a basis for the planning of orthodontic services. The indications for treatment were scored in four categories: treatment not necessary, doubtful, necessary and urgent. This addition to the FDI method undermines its objectivity and introduces a high degree of clinical judgement.

Kinaan and Burke (1981)[47] proposed a method whereby five features were assessed namely; overjet, overbite, posterior crossbite, buccal segment crowding and incisal alignment. Each dental arch was divided into three segments, an incisal segment and two buccal segments. The segments rather than individual teeth were then assessed in terms of intra-arch alignment and inter-arch relationships. However, this method requires four registration instruments for direct intra-oral assessment which makes it rather impractical for epidemiological purposes.

Cons et al (1986) [16] developed an index that concentrated on the correlation between occlusal morphology and socio-psychological handicaps. The DAI evaluates ten occlusal features: overjet, underjet, missing teeth, diastema, anterior open bite, anterior crowding, anterior spacing, mandibular protrusion, largest anterior irregularity (maxilla and mandible), and anteroposterior molar relationship.

Evans and Shaw (1987) [24] observed was that the IOTN aesthetic scale had a poor ability to represent dentofacial imbalance in the anteroposterior plane.

Brook and Shaw (1989) [12] formulated the Index of Orthodontic Treatment Priority. This was later named the Index of Orthodontic Treatment Need (IOTN). The IOTN has two discrete components namely a clinical (the dental health component and an aesthetic component). The dental health component has five grades ranging from grade one, "no need" for treatment, to grade five, "very great need." A grade is allocated according to the severity of the worst single trait that describes the priority for treatment. The aesthetic component consists of a series of numbered photographs that are rated for attractiveness on a 10-point scale.

Ghafari et al (1989) [30] stated that although epidemiologic indices are helpful in describing the general need for treatment in a given population, they should not be applied to the individual patient. At the population level, problems that are functionally handicapping are ranked first, while those involving a single tooth or minimally affecting an individual's well being are ranked last. However, on an individual level, even minor displacement of a single tooth could well be the cause of complaint. The IOTN weights tooth displacements heavily; this may be oversensitive, especially when the index is being used as an epidemiological tool. The purpose of the IOTN was to rank malocclusion based on the significance of various occlusal traits for dental health and aesthetic impairment, with the intention of identifying those who would be most likely to benefit from orthodontic treatment.

Shaw et al (1991) [69] the Peer Assessment Rating Index (PAR) was developed as an index of treatment standards. The subject is scored both at the start and at the end of treatment and the change in total score reflects the success of treatment in achieving overall alignment and occlusion.

Keay et al (1993) [46] they concluded about DAI, one of the notable features of this index is its ease of measurement. An added advantage is that this index provides good sensitivity, but at the cost of over-estimation of the number of subjects requiring treatment.

Tang (1993) [82] tested IOTN against the OI in Hong Kong, they felt IOTN had the advantage of simplicity.

Tang (1994) [83] studied 108 Hong Kong male dental students using the Occlusal Index (quantitative measurement) and found that 58% of students had good occlusion or no need for treatment (Grade 1 or 2), while 19% of them had minor treatment need (Grade 3) and 46% required definite treatment or had the worst occlusion (Grade 4 or 5). The most commonly occurring feature was crowding (39%) followed by Class II malocclusion (21%) and Class III malocclusion (15%).

Otuyemi (1995) [63] DAI is limited by its failure to assess treatment need during the mixed dentition effectively. It also cannot distinguish features that constitute aesthetic impairment like dental midline discrepancy, traumatic deep bite, posterior crossbite and open bite, which, although of limited aesthetic importance, can undoubtedly, affect the need for orthodontic treatment.

Holmes (1996)[39] also explored the utility of IOTN. Among British orthodontists,75%utilized at least the DHC component. Quick, easy to use were the most common descriptions the orthodontists used to describe IOTN

Jones (1996) [44] IOTN was investigated by who found that it was readily accepted by experienced dental epidemiological examiners and each examination averaged less than two minutes.

Younis (1997) [96] since IOTN has roots in Sweden with modifications in the U.K., it is important to consider its cross-cultural adaptability. Utilized Receiver Operating Characteristic curves to compare IOTN,HLD,HMAR and PAR. They concluded that IOTN had the highest diagnostic accuracy with 98.6% under the curve with HLD at 96.1%,HMAR with 96.6%.

Lindauer (1998) [53] compared the salzman index, with IOTN and concluded that different patients were likely to be approved for treatment depending on the index used. however, the salzman index does not include an esthetic or psychological component. This was deemed important by the 1993 AAO orthodontic indices conference

The AAO orthodontic indices conference concluded that;

a) The HLD, while easy to use and reliable ,lacked validity because of arbitrary weightings of factors.
b) The TPI was inappropriate for treatment need because it was not designed as an index.
c) The salzman index was neither reliable nor valid of the new indices, IOTN most merited further research into its reliability and validity.

Tarvit and Freer et al (1998) [87] compared IOTN and DAI, the assessment was done by four orthodontists and they found there was a significant reduction in the subjective severity and DAI scores across the whole sample and in the mixed dentition

group. There was a non –significant reduction in the AC scores across the whole sample, but there was a significant reduction in the AC scores in the mixed dentition subgroup, The DHC proved to be more stable over the period of study.

Daniels and Richmond (2000) [18] The Index of Complexity, Outcome and Need (ICON) was developed as a single index for assessing treatment inputs and outputs. The aesthetic component of the IOTN as well as crossbites, upper arch crowding/spacing, buccal segment anteroposterior and anterior vertical relationships are scored on study casts and used to predict treatment need, outcome and complexity.

Beglin et al (2001) [9] When looking at the predictive, specificity and sensitivity values for the DAI, HLD and IOTN, found that these indices have cut-off points that underscore and are set to exclude many malocclusions that the orthodontist panel would have treated.

Hägg et al (2001) [36] used the IOTN (grade index scales) to study 223 young Chinese adults attending a dental clinic. They reported that more than half (54%) of the studied adults had 'great' or 'very great' orthodontic treatment need. 31% of those adults had 'moderate' treatment need, and 15% had 'little' or 'no' treatment need.

Neslihan Ucuncu (2001)[90] they done a study on Turkish school children of 11-14 years of age, assessed by IOTN index. They concluded that the difference between the IOTN values for the boys and girls were not statistically significant in both groups and also 38.8 %of Turkissh school population showed great need treatment.

Fox, Daniels and Gilgrass (2002) [28] when comparing the ICON with the PAR and IOTN found that it showed significant correlations with these two indices and concluded that the ICON as a single index may effectively replace them as a means of determining treatment need and outcome.

S.J.Abu Alhaija et al (2004) [2] undertaken a study among 12-14-year old north Jordanian school children.1002 students randomly selected to assess treatment need and the results showed that approximately one –third of the children examined had a definite need for orthodontic treatment.with in this group, 73.5 %were in need of orthodontic treatment according to the DHC, 23.5 % had both DHC and AC great need scores,and 3% were in need according to the AC only.

David Manzanera et al (2004) [20] the aim of this study was to determine the prevalence of malocclusion and orthodontic treatment need in 12- to 16-year-old Spanish schoolchildren using the aesthetic component (AC) and Dental Health Component (DHC) of the Index of Orthodontic Treatment Need (IOTN) and to analyse the relationship with gender and age Orthodontic treatment need, using the DHC, was found in 21.8 per cent of the 12-year-olds and in 17.1 per cent of the 15- to 16-year-olds; and with the AC in 4.4 and 2.4 per cent, respectively. Considering both components together, 23.5 per cent of the population of 12-year-olds and 18.5 per cent of 15- to 16-year-olds had a defi nite treatment need. No gender dependent differences were found. Spanish orthodontic treatment need is similar to that reported in most recent studies in Europe, with approximately one in five to six children with an orthodontic treatment need.

Eve Taushe et al (2004) [25] they done a study on 1975 children aged between 6 and 8 years were used to estimate the prevalence of malocclusion, The results showed that deep overbite and overjet, both more than 3.5mm,were the most frequent discrepencies affecting 46.2 and 37.5 % of patients, respectively. An anterior open bite was registered in 17.7%, cross bite in 8.2%, and a reverse overjet in 3.2%.and inferred that early development of progressive malocclusion symptoms which are evidenced in the IOTN data give support for early treatment need.

Jen Soh et al (2004) [45] they done a study with the help of IOTN to assess the objective and subjective levels of orthodontic treatment need in a sample of orthodontically untreated adult Asian males and concluded that Malay males had the highest percentage with a definite need for treatment for both dental health and esthetic reasons in comparison with Chinese and Indian males.

Marjo Kirsi et al (2005) [57] done a prospective study from Eight to 12 years of age using IOTN index .They noted that treatment need changed significantly from eight to 12 years. Of the 29 children with definite treatment need at age eight years, only two had treatment need at 12 years and concluded that systematically planned early orthodontic treatment may have contributed to the significant reduction in treatment need from eight to 12 years of age.

Mhd Nour Alkhatib et al (2005) [59] in their study was carried out to determine the prevalence of orthodontic treatment need in children from minority ethnic groups and compare the need to the white population .From the study they concluded that ethnicity did not influence orthodontic need for treatment based on clinical or esthetic grounds.

However children of Indian and Chinese ethnicities had a slightly higher clinical need for treatment.

Mourad Souames et al (2006) [60] in 2006 their survey was undertaken to assess the orthodontic treatment need in a sample of 9-to 12-year –old French children attending 12 different schools in the same geographic areas of france and concluded that the DHC was found to be reliable, quick, esay to use but AC alone failed to identify any children needing orthodontic treatment .Compared with the dental appearance of Caucasian Americans and other European children ,these French school children were found to have better dental esthetics and, consequently, a lower orthodontic treatment need.

Hedayati et al (2007) [37] in Iran they conducted a study to evaluate treatment need of 11 and 14 year school children .The results of DHC showed that 18.39% of population showed severe and very severe need for treatment,25.8% were in border line category,48.1%had a slight need and the percentage for no need to treatment was 7.63%.During AC 91.3% were in no need or little need,3.91% in moderate need and 4.11% in great need to treatment group The results indicate that correlation between DHC and AC was very week.

Hosseinzadeh et al (2007) [41] they had a sample of 427, 17 year old students from schools in Abade. According to DHC classification, 18.7% of the students were in the no need , 35.6% in the border line and 45.7% in the definite need groups.AC assessment by students and parents entitled even more students in no need category.

Maja Ovsenik et al (2007) [54] the study was done to compare the validity, reliability, and time needed to use the EI, EF, and IOTN indices. The author concluded that EF and EI indexes are the most time consuming methods, whereas the IOTN is the least time consuming of the 3 methods.

Papa Ibrahima Ngom et al (2007) [65] the study was to assess the normative need, knowledge of, and demand for orthodontic treatment in Senegalese school children aged 12–13 years, using IOTN and ICON indices the DHC and the AC of the IOTN and the ICON classified respectively 42.6%, 8.7% and 44.1% of the children as having a definite need for orthodontic treatment. There were no ethnic or gender differences with respect to normative orthodontic treatment need. The mean ICON score ranged from 42.31 to 44.46 according to the ethnic group. Only 10% of the children had some knowledge of orthodontics. However, between 17% and 30% of the children clearly expressed a need for orthodontic treatment, and the distribution between ethnic groups was significant. In contrast, there were no significant gender differences concerning demand for treatment.

Simon Camillery, Kevin Mulligan (2007) [76] they done a study on 530 12 year old Maltese and Gozitan school children ,the examination was conducted by two qualified orthodontists. The result they concluded that higher number of Grade 1 and Grade 5 malocclusions found in Maltese school children.

Prof. Urban Hagg et al (2007) [92] the purpose of their review to briefly describe the commonly used occlusal indices and evaluate the relationship among them and concluded that IOTN can be used to evaluate to assess the prevalence of malocclusion and determine orthodontic treatment.

Kolawole, Otuyemi et al (2008) [48] they done a study to determine the objective orthodontic treatment need of a group of school children and a referred population using the Index of Orthodontic Treatment Need (IOTN) and establish the relationship between subjective and objective orthodontic treatment need. The professional assessment of treatment need of the children in the school population based on the Aesthetic Component of IOTN were 62.8% no need, 30% moderate need and 7.2% great need for orthodontic treatment, the referred population had 19.7%, 36.3% and 43.9% respectively. The Dental health component resulted in 66% no need, 20% moderate need and 14% great need for treatment in the school population. These percentages were 20.4%, 16.6% and 63% respectively in the referred population. Statistically significant differences were found between subjective and professional assessment of orthodontic treatment need in both populations.

David Manzanera et al (2009) [19] they took a study with the help of IOTN among 10-12-year old Valencia school childrens, and concluded that 30% of the sample need treatment, 41% had a moderate need, 29% of the sample under no need of treatment, also they found that the results are quite similar to other studies carried out in spain.

Parviz padisar et al (2009)[64] assessed the orthodontic treatment need on the basis of IOTN index those who had come for orthodontic treatment. The results with determination of subjective needs on the basis of AC by patient's perceived need indicate a lock of significant relation between gender and the patients' perceived need for AC ($p<0.05$). Most of these patients had determined their AC to be between grade 1-4, the results of AC determination through normative need assessment were the same as the results of perceived need Assessment. Which, in case of DHC determination it was

revealed that most subjects had a grade between 4 and 5 and there was a significant relation between DHC and type of malocclusion ($p<0.05$). Subjective data of IOTN index alone cannot be considered an appropriate indicator of orthodontic treatment needs determination.

Letizia perillo et al (2010) [51] the survey was performed to determine orthodontic treatment need in a large sample (*n* = 703) of 12-year-old schoolchildren from the southern part of Italy. The sample comprised 331 males (47 per cent) and 372 females (53 per cent), all orthodontically untreated. The findings indicated that this southern Italian school population showed a rather low prevalence rate for objective need for treatment (grades 4 and 5; 27.3 per cent of the total sample). This prevalence rate is generally lower than those reported in northern and central European countries (Sweden, Germany, and UK) but slightly greater than those in France. No significant differences in the DHC grades of the IOTN were found between genders.

The material and methodology used in this study are described below.

Materials

1. A Mouth mirror.
2. A Periodontal probe.
3. Disposable gloves.
4. A sharp HB pencil.
5. An orthodontic ruler.
6. An orthodontic impression trays.
7. A fast setting alginate impression material.
8. Kalabai orthocal die stone.
9. A Nikon Digital SLR camera (Japan).
10. Orthopantomogram. (SIRONA ORTHOPHOS XG 5 USA)
11. Cheek retractor

Methodology:

The present study was undertaken to evaluate the prevalence of severity and treatment need in Coimbatore population using OCCLUSAL[80] and IOTN[12] indices.

The study sample comprised of two hundred out- patients of age above 13 years, who came to Department of Orthodontics and Dentofacial orthopaedics, Sri Ramakrishna Dental College and Hospital Coimbatore for orthodontic treatment.

The subjects selected in the study were all above thirteen years of age. This age group was selected because the full complement of the adult dentition is expected in the mouth.

All the subjects were made to sit on a dental chair and frontofacial intraoral photographs were taken with relaxed perioral musculature, and impressions were made with alginate impression material.

STUDY DESIGN

This is a discriptive study documenting the occlusal traits in all three planes of space of the sample population.

PILOT STUDY

A pilot study was done on five randomly selected patients and the intra examiner reliability[83] was found to be 90% which was considered acceptable.

DATA ANALYSIS

The data collected for each patient were entered on the scoring sheet and quantified according to the respective indices.

METHOD OF EXAMINATION

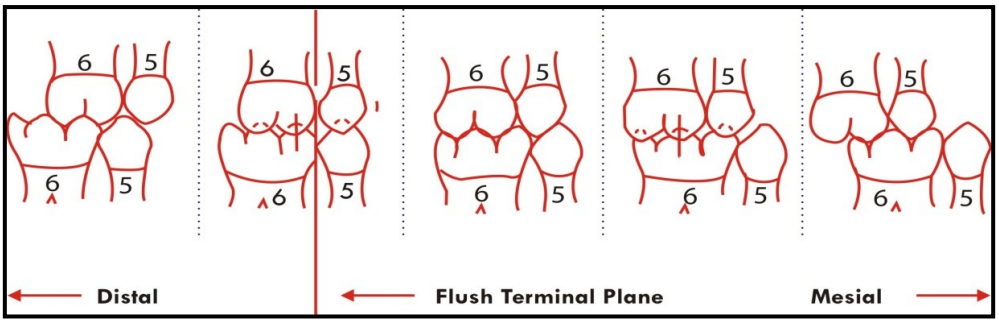
EVALUATION OF SEVERITY USING OCCLUSAL INDEX

1. DENTAL AGE

The first step In Occlusal Index is to classifying the occlusion into a dental age. Our study comprised of Dental age VI , dental age 6 begins when all permanent canines and bicuspids are in occlusion, and this dental age is characterized by the presence of the completed permanent dentition (second molars may or may not have erupted).

2. MOLAR RELATION

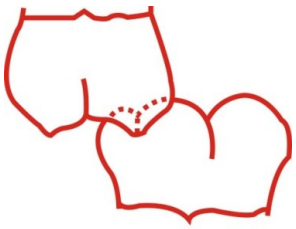
The second step in occlusal index will be scoring of molar relation .



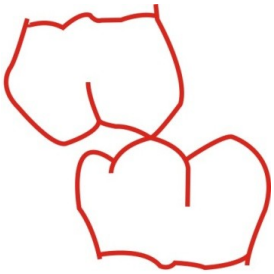
I. MESIAL. The mesiobuccal cusp of upper first molar occludes with the distobuccal cusp of lower first molar.

2. DISTAL. The mesiobuccal cusp of upper first molar occludes with the mesiobuccal cusp of lower first molar. According to summer five molar relations can exist for the permanent dentition.

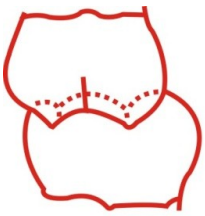
More Mesial- The mesiobuccal cusp of the upper first molar articulates with the distobuccal groove of the lower first molar or the interproximal space between the lower first and second molars.



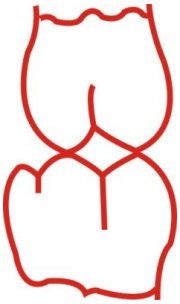
Mesial- An end-to-end relationship exists whereby the tip of the mesiobuccal cusp of the upper first molar articulates with the tip of the distobuccal cusp of the lower first molar.



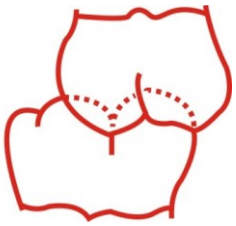
Normal- A normal relationship exists whereby the mesiobuccal cusp of the upper first molar articulates with the buccal groove of the first molar.



Distal- An end-to-end relationship exists whereby the tip of the mesiobuccal cusp of the upper first molar articulates with the tip of the mesiobuccal cusp of the lower first molar.



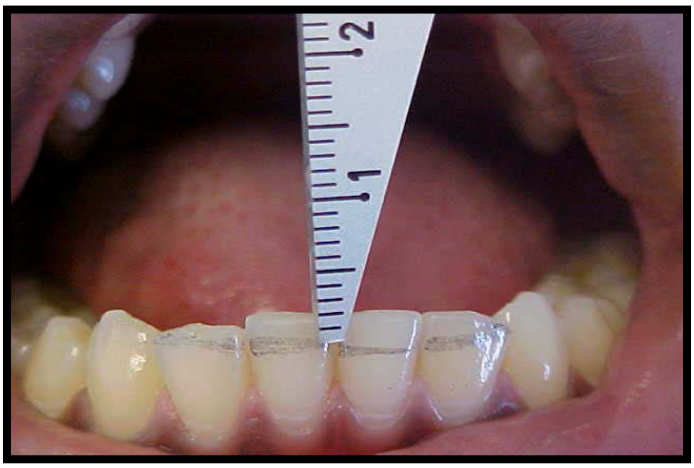
More Distal- The distobuccal cusp of the upper first maxillary molar articulates with the buccal groove of the lower first molar.



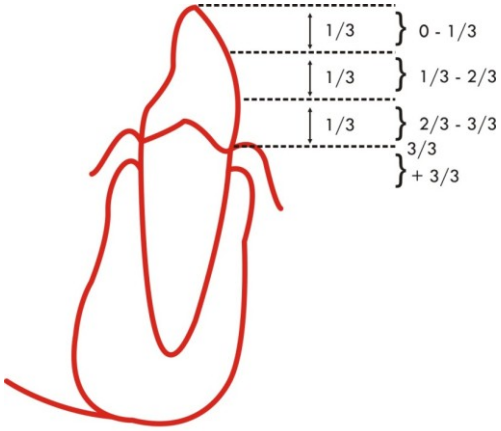
NOTE-In clinical situation,the scoring will differ accordingly with the combination of molar relationship.

3- MEASUREMENT OF OVERBITE

Overbite is scored as the vertical distance from the incisal edge of the maxillary central incisor to the incisal edge of the mandibular central incisor when the jaws are in "centric occlusion.

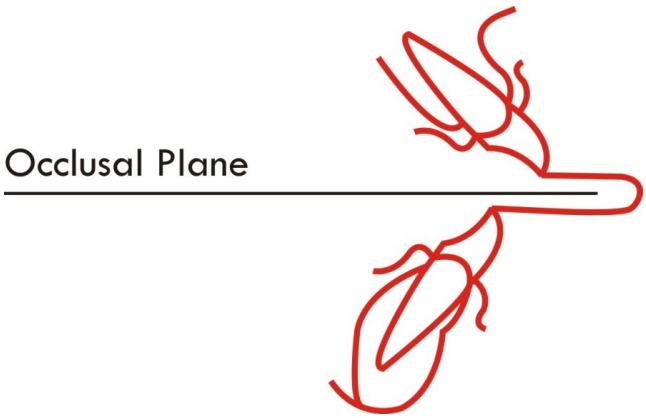


1- Positive overbite is scored as the distance the maxillary central incisor occludes past the mandibular central incisor,and this distance is scored in "thirds" of the length of the clinical crown of the mandibular central incisor.



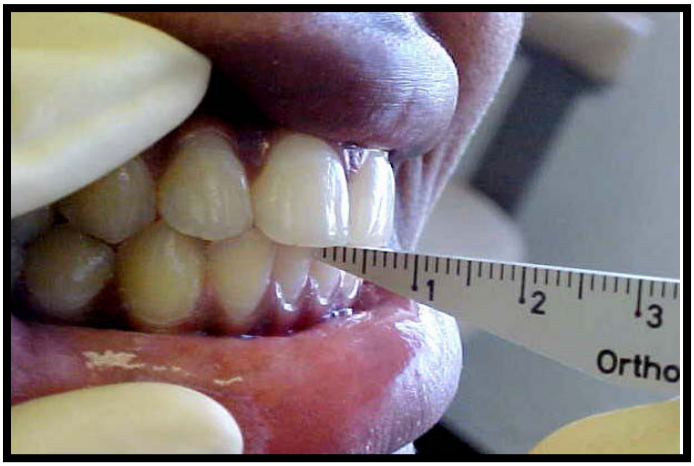
Scoring of Positive Overbite

2- Negative overbite or open-bite is scored as the vertical distance from the incisal edge of the maxillary central incisor to the incisal edge of the mandibular central incisor in millimeters.

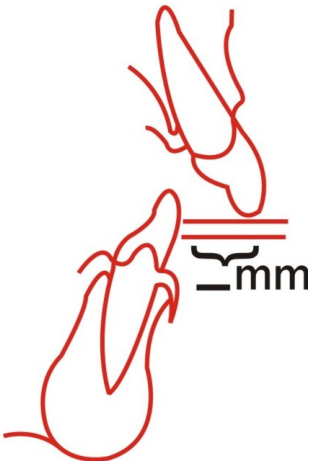


4-MEASUREMENT OF OVERJET

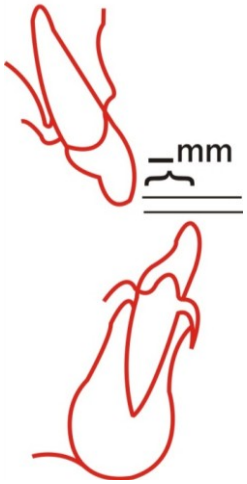
OVERJET is scored as the horizontal distance from the labial surface of the maxillary central incisor to the labial surface of the mandibular central incisor in millimeters. According to the variations in millimeter , scores may be positive, zero, or negative.



Positive overjet



Negative overjet



5-MEASUREMENT OF POSTERIOR CROSS BITE

According to summers Cross-bite may be dental, functional, or osseous. Therefore, in order for posterior cross-bite to be an indicator of the osseous relation, it must be differentiated from other types of cross-bite.

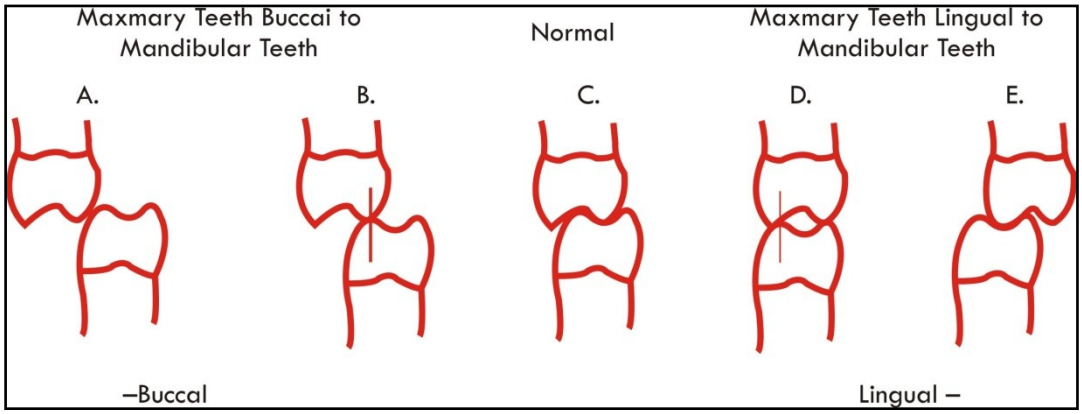
Dental cross-bite usually involves a tipping of one tooth as a result of space insufficiency. The condition is localized and does not affect the size or shape of the basal bone. In dental cross-bite the tooth will not be in normal arch alignment and will be considered as a displaced tooth rather than a cross-bite.

Functional cross-bite involves muscular adjustment to tooth interferences. The teeth seem to be in normal arch alignment, but the lower jaw will not close without shifting, thereby causing the functional cross-bite

Osseous cross-bite involves a gross mesiolateral disharmony of the craniofacial skeleton. All teeth seem to be in normal arch alignment. When a single tooth is involved, it is usually the most posterior molar; the premolars are in osseous cross-bite only when the molars are also in cross-bite.

Cross-bite may be unilateral or bilateral and is scored similarly to molar relation, in that posterior cross-bite has definite “cut-off” points and can assume five cuspal relations, as illustrated in Fig. The buccal cusp of the mandibular posterior tooth is used as the cusp which determines the posterior cross-bite cuspal relation. Posterior cross-bite is scored the same for the deciduous, mixed, or permanent dentitions; that is, one counts

the number of teeth in the maxillary arch which are in each type of posterior cross-bite cuspal relation.



MEASUREMENT OF POSTERIOR OPEN BITE

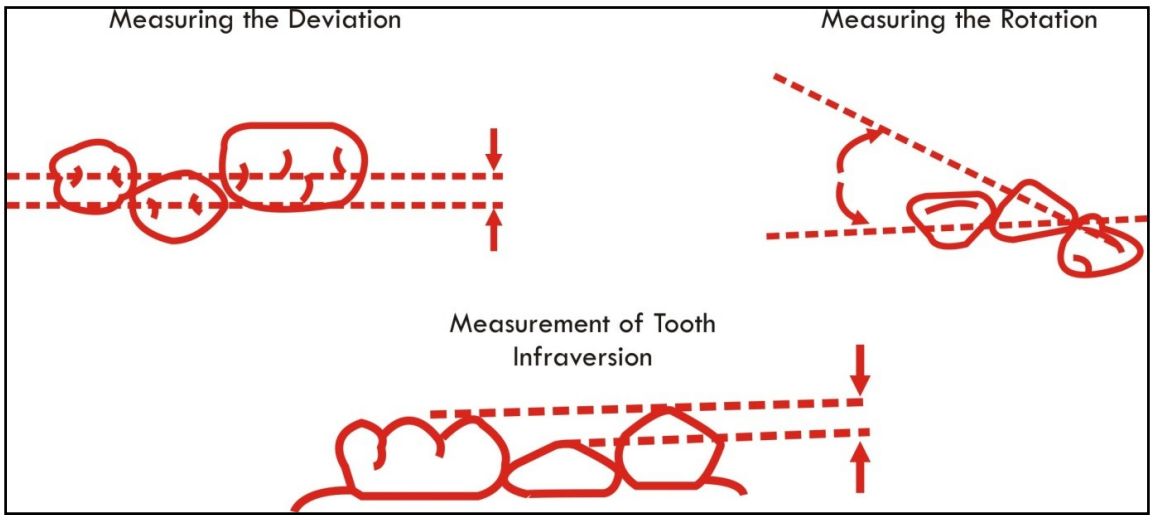
Posterior open-bite identified as the lack of occlusal contact between any opposing posterior teeth (posterior teeth include the deciduous canines and molars, and the permanent canines, premolars, and molars) with the jaws in "centric occlusion." Posterior open-bite may be unilateral or bilateral and may accompany an anterior open-bite (negative overbite). Posterior open-bite is scored as either present or not present and, if present, as either unilateral or bilateral. Generally, two or more adjacent posterior teeth will be in open-bite.

MEASUREMENT OF TOOTH DISPLACEMENT

The tooth displacement includes mesio distal, labiolingual disharmony of the tooth from normal arch alignment .The scoring of tooth displacement in the permanent dentition can be categorized in to two degrees of displacement:

Premolars and molars are not scored for rotation in the occlusal index. A tooth may be in normal arch alignment buccolingually, but, because of space deficiency, it may

be blocked by the adjacent teeth and fail to erupt completely. A. tooth in this situation is sometimes referred to as being in infraversion and is scored as "1.5 to 2.0 mm. deviation."



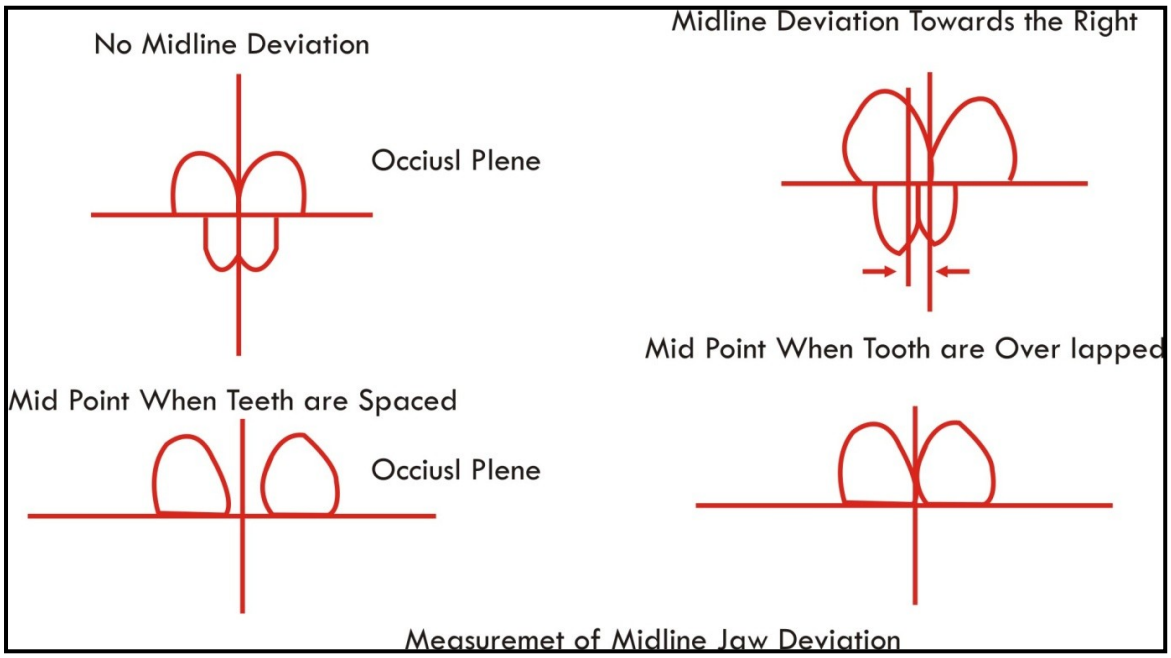
MEASUREMENT OF MIDLINE RELATIONSHIP

DIASTEMA

A midline diastema is defined as the space, in millimeters, between the two maxillary central incisors, either deciduous or permanent, which have erupted into occlusion. When the diastema equals or exceeds 2 mm., it is given a weight in the occlusal index.

MEASUREMENT OF JAW DEVIATION

Midline jaw deviation is measured as the distance, in millimeters, between the midpoint of the two maxillary central incisors and the midpoint of the two mandibular central incisors in the horizontal (occlusal) plane when the teeth are in centric occlusion. If any central incisor is missing, the procedure is not recorded. Jaw deviations of 3 mm. or more are given a weight in the occlusal index.



MEASUREMENT OF MISSING PERMANENT TEETH

Only missing maxillary incisor teeth which have not been replaced by a prosthesis are scored. Here we have to simply records the number of missing maxillary incisors.

CALCULATING METHOD FOR OCCLUSAL INDEX

After getting all the information from previous measurements the individual calculating forms is available according to the Dental Age 6. The OI contains two divisions and seven syndromes. The examination item number is given in parentheses.

Divisions I and II" –NORMAL OR DISTAL MOLAR RELATION

- Syndrome A. Overjet and open-bite .
- Syndrome B. Distal molar relation, overjet , overbite. posterior cross-bite midline diastema, and midline deviation .
- Syndrome C. Congenitally missing incisors.
- Syndrome D. Potential tooth displacement and tooth displacement
- Syndrome E. Posterior open-bite.

Division III –MESIAL MOLAR RELATION

- Syndrome F. Mesial molar relation, overjet, overbite, posterior cross-bite , midline diastema and midline deviation.
- Syndrome G. Mixed-dentition analysis and tooth displacement.

One simply scores each examination item circles the score on the form (observation score), and places the weighted score (code) listed below the observation score in the appropriate column under the appropriate occlusal syndrome. The sum of the weights in all columns is then determined.

To arrive at the total score, it is necessary to ascertain molar relation. Then, the weights of all measurements will be placed in the syndromes of that division, and the score will be derived from only those syndromes. If Divisions I and II was circled, the score is the score of the syndrome with the highest score (either A, B, C, D, or E) plus one half of the total scores of the remaining syndromes.

If Division III was circled, the score is the score of the syndrome with the highest score (either F or G) plus one half of the total score of the other syndrome.

For example, if the molar relation were distal, Divisions I and II would be circled, and if the scores of syndromes were

Syndrome	A	B	C	D	E
Score	2.6	5.4	0.0	3.0	3.0

The OI score would be

$$\frac{\text{Score of the syndrome with the highest score plus Sum of remaining syndrome scores}}{2}$$

INTERPRETATION OF OCCLUSAL INDEX SCORES

The subjective classification resulted in the following classes:

1. **Good occlusions**- Scores in between 0.0 to 2.5, no evidence of an occlusal disorder.
2. **No treatment**- scores in between 2.6 to 4.5, Slight deviations in the occlusion, but no treatment indicated at this time.
3. **Minor treatment**- scores in between 4.6to 7.0, Minor deviations in the occlusion which could be remedied by simple treatment (that is, space regainers or removable appliances).
4. **Definite treatment** - score in between 7.0 to 11.0, Major deviations in the occlusion which could be remedied by major treatment (that is, treatment which would include banding of many teeth).

5. **Worst occlusions** - scores in between 11.1 to 16.0, Major deviations in the occlusion which could be remedied by major treatment; these occlusions were highly disfiguring to the patient and would probably rank first in treatment priority.

SCORING SHEET FOR OCCLUSAL INDEX

Name: Sex:

Age: Date:

																			OCCLUSAL SYNDROME						
																			I & II						III
																			A	B	C	D	E	F	G
	MOLAR RELATION					NORMAL			1 sides c to c			2 sides c to c & 1 side +			1 side c to c & 1 side +			2 sides +							
1	DISTAL					0			1.5			2.2			2.9			3.7							
2	MEISAL					0			2			2.6			2.9			3.7							
3	if the molar relation is NORMAL or DISTAL Circle I & ii: if the molar relation is MEISAL Circle III.																								
	OVERJET (in mm)	>-3	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	>+11							
4	I&II DISTAL	2.2	2.0	1.8	1.4	1.0	0.5	0.0	0.0	0.5	0.9	1.1	1.3	1.5	1.7	1.9	2.1	2.3							
	I&II	4	3.5	3	2.5	2.1	1.7	0	0	1.1	1.9	2.6	3.4	4.1	4.8	5.6	6.5	7.4							
5	III	6.7	6.1	5.9	5.6	3.4	2.2	0	0									0							
	OVERBITE	(inmm)					(relation of upper incisor to lower)																		
		>-4	4 to -2		2 to 0		0 to 1/3		1/3 to 2/3		2/3 to 3/3		03-Mar		>3/3										
6	I & II	4.5	4		3.6																				
7	I & II DISTAL						0		1.3		2.3		3.7		5.0										
8	III						0		0.8		1.8		2.7		3.9										
	CONGENITIALLY MISSING	number					0	1	2	3 or 4															
9	INCISORS I & II	code					0	5.4	6.5	8															
10							0	1	2	3	4	5	6	7	8										
	POSTERIOR CROSS BITE BUCCAL			I & II		(c to c)	0	0.7	0.8	1	1.1	1.2	1.3	1.4	1.5										
				I & II		(>c to c)	0	1.5	2.0	2.5	3.0	4.0	5.0												
							0	1	2	3	4	5	6												
			11	I & II		(c to c)	0	0.7	0.8	1	1.1	1.4	1.6												
				I & II		(>c to c)	0	1.5	1.8	2	2.5	2.8	3												
			12	III		(c to c)	0	1.2	1.4	1.7	2	2.5	3												
	POSTERIOR CROSS BITE LINGUAL			III		(>c to c)	0	2.2	2.4	2.7	3	3.5	4												
13	POSTERIOR OPEN BITE															unilateral		bilateral							
		I & II														3.0		4.2							
14																									
	TOOTH DISPLACEMENT																								
	Rotated 35 - 45 or rotated>45 or Displaced 1.5-2 mm___+displaced>2 mm____x2=_____Total																								
	I & II and III same code	0	1	2	3	4	5	6	7	8	9	10 or more													
	code the total	0	2	3	4	5	6	7	8	8.6	9.3	10													
15	MIDLINE DIASTEMA (in mm) (I&II and III same code) the same code)	0 to 1			2			3			4 Or more														
		0			0.5			1.0			1.5														
16	MIDLINE DEVIATION (in mm) (I&II and III the same code)	0 to 2			3 to 4			5 or more																	
		0			0.5			1.5																	
17	TOTAL SCORE OF FOR THE OCCLUSAL INDEX																								

EVALUATION OF TREATMENT NEED USING I.O.T.N. INDEX

Brook and Shaw developed a valid and reproducible index (Index of orthodontic treatment need - IOTN) to determine orthodontic treatment need. This index intends to identify those individuals who would most likely benefit from orthodontic treatment. The index has two components, the Aesthetic (AC) and Dental health components(DHC)), which rank malocclusion in increasing priority according to aesthetic considerations and dental health implication.

Dental Health Component (DHC)

The purpose of dental health component is to look for features that could impair the health and function of the dentition. The objective assessment of occlusal traits for all 200 samples were assessed for the severity and treatment need. The dental health component of the IOTN has five grades, ranging from grade 1, which represents a negligible need for treatment, to grade 5 which indicates an urgent or high priority for treatment.

DHC uses a simple ruler and an acronym-MOCDO-to guide the observer to the single feature of the malocclusion. MOCDO represents Missing teeth, Overjet, Crossbite, Displacement of contact points, Overbite. There are 5 categories, from 1 representing no need for treatment to 5 representing a great treatment needed. For example when the subject has an impacted upper incisor then immediately categorized as IOTN 5 and no further assessment of the DHC is required. where there are no anomalies of tooth or position, the ruler will be useful to measure the overjet, for example an increased overjet of 6-9mm will be IOTN 4.

Aesthetic Component (AC)

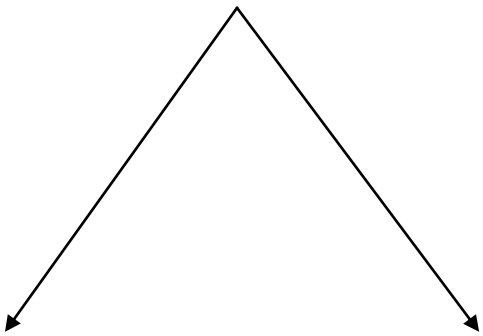
The second part of the overall assessment of treatment priority has to record the Aesthetic impairment contributed by the malocclusion, for this component the SCAN index was utilized.

AC consists of a scale of ten colour photographs showing different levels of dental attractiveness. The dental attractiveness of prospective patients can be rated with reference to this scale. Grade 1 represents the most and grade 10 the least attractive arrangement of teeth. The score reflects the aesthetic impairment.

All 200 samples were assessed their own occlusion using a colour photographs of the AC during a clinical examination in our department, in order to make the assessment more reliable, a lip retractor and a mirror were employed and then the following question was asked here is a series of 10 photographs showing a range of dental attractiveness, number 1 is the most and number 10 the least attractive arrangement of the teeth, where would you put your teeth on this scale?. At each examination a general aesthetic impression was made, not an exact match with one of the photographs, at the same time grade was rated using AC scale.

Grade 1, 2, 3 and 4 represents no or slight need for treatment, grade 5, 6 and 7 represents moderate or borderline need for treatment, grade 8, 9 and 10 represents need for orthodontic treatment.

The Index of Orthodontic Treatment Need (IOTN)



Dental health Component

10 features of traits of malocclusion observed

1. Overjet
2. Reverse over jet
3. Overbite
4. Openbite
5. Crossbite
6. Displacement of teeth
7. Impeded eruption of teeth
8. Defects of cleft lip and palate
9. Class II and Class III buccal occlusions
10. Hypodontia

Aesthetic Component

Dental health component (DHC) grading

Grade 1 –No Treatment Required.

Extremely minor malocclusions including contact point displacements less than 1mm

Grade 2-Little Treatment Needed.

- 2.a Increased overjet greater than 3.5mm but less than or equal to 6mm with competent lips.
- 2.b Reverse overjet greater than 0mm but less than or equal to 1mm.
- 2.c Anterior or posterior crossbite with less than or equal to 1mm discrepancy between retruded contact position and intercuspal position.
- 2.d Contact point displacements greater than 1mm but less than or equal to 2mm.
- 2.e Anterior or posterior openbite greater than 1mm but less than or equal to 2mm.
- 2.f Increased overbite greater than or equal 3.5mm without gingival contact.
- 2.g Pre-normal or post-normal occlusions with no other anomalies .Includes up to half a unit discrepancy.

Grade 3 –Moderate or Borderline Treatment Needed.

- 3.a Increased overjet greater than 3.5mm but less than or equal to 6mm with incompetent lips.
- 3.b Reverse overjet greater than 1mm but less than or equal to 3.5mm.
- 3.c Anterior or posterior crossbites with greater than 1mm but less than or equal to 2mm discrepancy between retruded contact position and intercuspal position.
- 3.d Contact point displacements greater than 2mm but less than or equal to 4mm.
- 3.e Lateral or anterior open bite greater than 2mm but less than or equal to 4mm.
- 3.f Increased and incomplete overbite without gingival or palatal trauma.

Grade 4 -Great Treatment Needed

- 4.h Less extensive hypodontia requiring prerestorative orthodontics or orthodontic space closure to obviate the need for a prosthesis.
- 4.a Increased overjet greater than 6mm but less than or equal to 9mm.
- 4.b Reverse overjet greater than 3.5mm with no masticatory or speech difficulties.
- 4.c Anterior or posterior crossbites with greater than 2mm discrepancy between retruded contact position and intercuspal position.
- 4.l Posterior lingual crossbite with no functional occlusal contact in one or both buccal segments.
- 4.m Reverse overjet greater than 1mm but less than 3.5 with recorded masticatory and speech difficulties.
- 4.d Severe contact point displacements greater than 4mm.

Grade 5 -Very Great Treatment Needed.

- 5.iImpeded eruption of teeth (except for third molars) due to crowding, displacement, the presence of supernumerary teeth, retained deciduous teeth and any pathological cause.
- 5.hExtensive hypodontia with restorative implications (more than 1 tooth missing in any quadrant) requiring pre-restorative orthodontics.
- 5.a Increased overjet greater than 9mm.
- 5.m Reverse overjet greater than 3.5mm with reported masticatory and speech difficulties.
- 5.p Defects of cleft lip and palate and other craniofacial anomalies.
- 5.s Submerged deciduous teeth.
- 4.e Extreme lateral or anterior open bites greater than 4mm.

- 4.f Increased and complete overbite with gingival or palatal trauma.
- 4.t Partially erupted teeth, tipped and impacted against adjacent teeth.
- 4.x Presence of supernumerary teeth.

A total of 200 subjects were assessed for severity and treatment need using OI, DHC (IOTN), & AC (IOTN) indices. There were 78 male and 122 female samples as a part of the study. Normality tests were performed using One – sample Kolmogorov – Smirnov test for all the above mentioned variables, to check for normal distribution of sample size. The results indicate two of the above three variable showed significance value of less than 0.05, inferring the malocclusion sample is not normally distributed. To know whether there was any association between gender and frequency of malocclusion, Chi-Square test was performed and the results showed that no association between the gender and indices observed.

Frequency test was performed for all the 200 samples for severity & treatment need. The results obtained from occlusal index indicates that 44 samples came under the category of "little or no treatment" , 90 samples requiring "moderate and border line treatment" and the remaining 66 samples for greater treatment need .The scores ranging from .5 to 15 with the mean value of 6.300.

When assessed by the IOTN- DHC, 34 subjects fell into grades 1or 2, indicating their treatment need was either none or little. The total number of subjects with IOTN grades of 3 indicating moderate treatment need was 60.Among 200 samples IOTN puts very great treatment needed for 106 subjects. The scores ranging from 1 to 5 with the mean value of 4.

Subjective assessment was done with the help of IOTN- AC and the results showed that 51 samples under the category of little or no treatment,127 samples requiring

moderate and borderline treatment and the remaining 22 requiring very great treatment need. The scores ranging from 2 to 10 with the mean value of 5.

Correlation test was performed with the help of Spearman's rho correlation method, and concluded to have moderate level of correlation between the three variables.

Cohen's Kappa inter – rater agreement reliability test was done to know the reliability of grading between three variables. According to kappa statistics, there was fair agreement between Objective assessment of OI and DHC of (IOTN), OI &AC in grading severity & treatment need. There was only slight agreement between IOTN DHC & AC.

Inference:

From Table 1, since two asymptotic significance values are lesser than 0.05 (5% level of significance), the null hypothesis is rejected for respective variables data. It is inferred that the results obtained is not normally distributed.

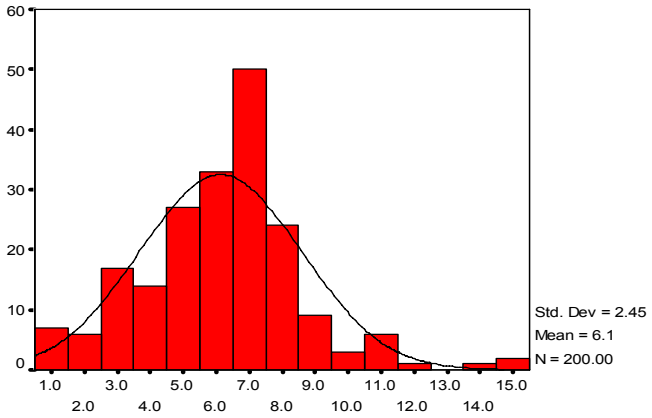
Table 1: One-Sample Kolmogorov-Smirnov Test

		OI	DHC	AC
N		200	200	200
Normal Parameters(a,b)	Mean	6.136	3.495	5.550
	Std. Deviation	2.4496	1.0224	1.5162
Most Extreme Differences	Absolute	.082	.219	.172
	Positive	.082	.156	.172
	Negative	-.063	-.219	-.103
Kolmogorov-Smirnov Z		1.163	3.102	2.427
Asymp. Sig. (2-tailed)		.134	.000	.000

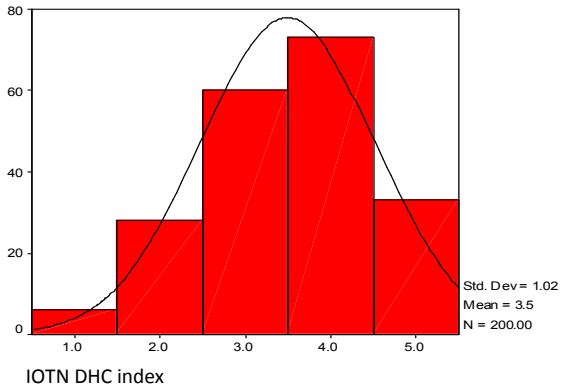
a Test distribution is Normal.

b Calculated from data.

Graph 1:



Graph 2:



Graph 3:

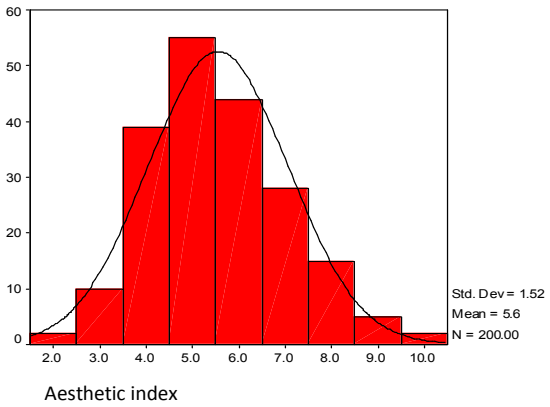


Table 2: Requirements based on Occlusal Index (OI) * GENDER

Crosstab

			GENDER		Total
			MALE	FEMALE	
Requirements based on OI	Good occlusions	Count	6	7	13
		% within GENDER	7.7%	5.7%	6.5%
	No treatments	Count	11	20	31
		% within GENDER	14.1%	16.4%	15.5%
	Minor treatment	Count	35	55	90
		% within GENDER	44.9%	45.1%	45.0%
	Definite treatment	Count	23	37	60
		% within GENDER	29.5%	30.3%	30.0%
	Worst occlusions	Count	3	3	6
		% within GENDER	3.8%	2.5%	3.0%
Total		Count	78	122	200
		% within GENDER	100.0%	100.0%	100.0%

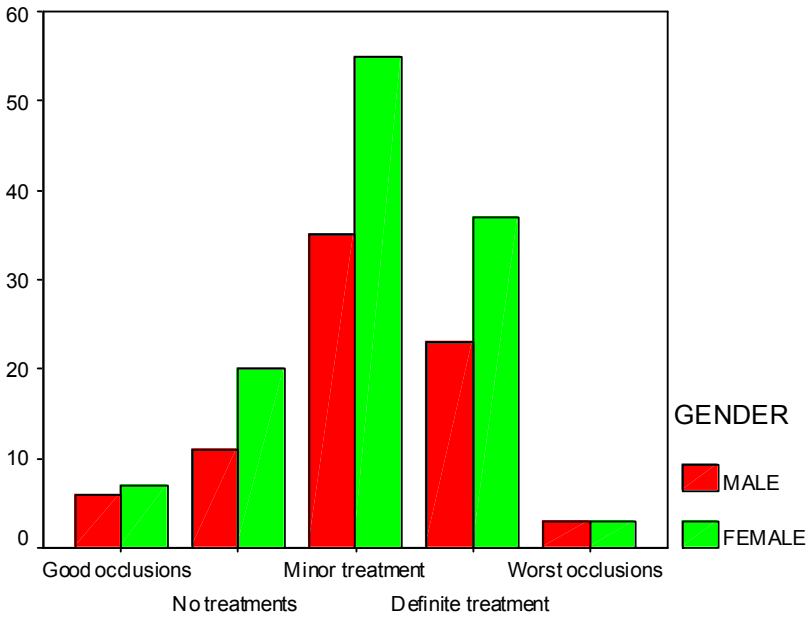
Table 3: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.758(a)	4	.944
Likelihood Ratio	.747	4	.945
Linear-by-Linear Association	.001	1	.981
N of Valid Cases	200		

a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 2.34.

Since Sig value is greater than 0.05 (5% level of significance), the null hypothesis is accepted. Results are same irrespective of the gender.

Graph 4:



Requirements based on Occlusal Index

Table 4: Requirements based on (IOTN) DHC Index * GENDER

			GENDER		Total
			MALE	FEMALE	
Requirements based on DHC	None	Count	2	4	6
		% within GENDER	2.6%	3.3%	3.0%
	Little treatment	Count	12	16	28
		% within GENDER	15.4%	13.1%	14.0%
	Moderate	Count	22	38	60
		% within GENDER	28.2%	31.1%	30.0%
	Great treatment	Count	28	45	73
		% within GENDER	35.9%	36.9%	36.5%
	Very great	Count	14	19	33
		% within GENDER	17.9%	15.6%	16.5%
Total		Count	78	122	200
		% within GENDER	100.0%	100.0%	100.0%

Table 5: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.569(a)	4	.966
Likelihood Ratio	.568	4	.967
Linear-by-Linear Association	.039	1	.844
N of Valid Cases	200		

a 2 cells (20.0%) have expected count less than 5. The minimum expected count is 2.34.

Since Sig value is greater than 0.05 (5% level of significance), the null hypothesis is accepted. Results are same irrespective of the gender.

Graph 5:

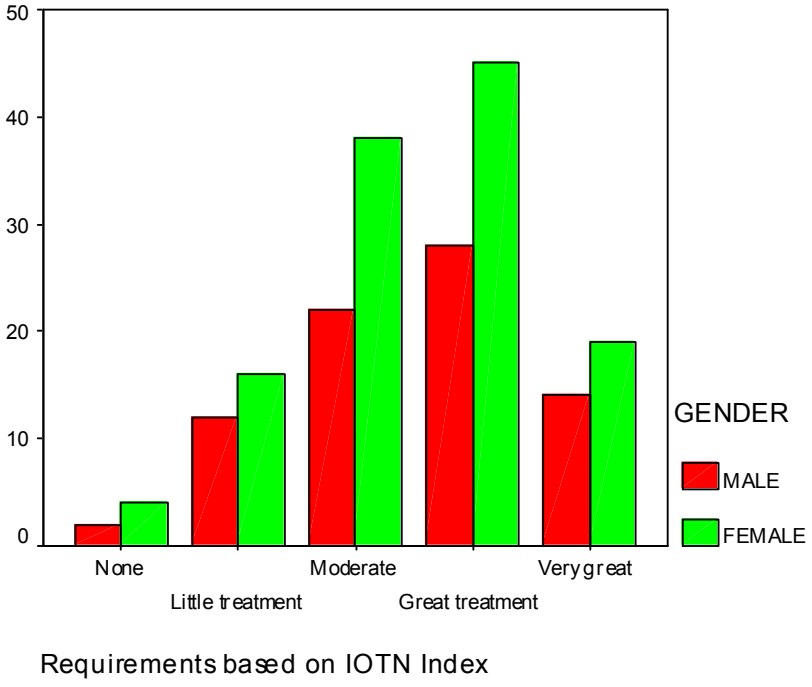


Table 6: Requirements based on Aesthetic Component(AC) * GENDER

			GENDER		Total
			MALE	FEMALE	
Requirements based on AC score	Little or No treatment	Count	21	30	51
		% within GENDER	26.9%	24.6%	25.5%
	Moderate and Border line treatment	Count	49	78	127
		% within GENDER	62.8%	63.9%	63.5%
	Treatment required	Count	8	14	22
		% within GENDER	10.3%	11.5%	11.0%
Total		Count	78	122	200
		% within GENDER	100.0 %	100.0%	100.0%

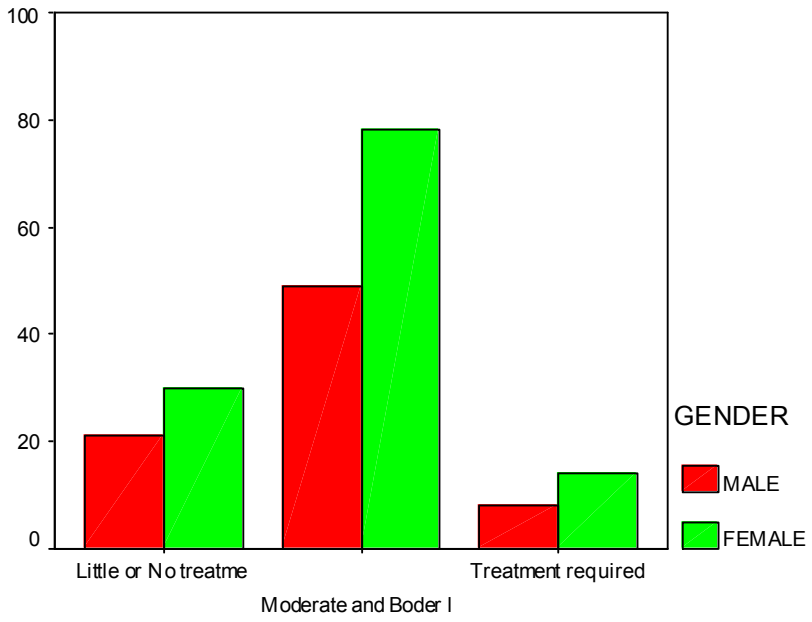
Table 7: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.175(a)	2	.916
Likelihood Ratio	.175	2	.916
Linear-by-Linear Association	.174	1	.677
N of Valid Cases	200		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.58.

Since Sig value is greater than 0.05 (5% level of significance), the null hypothesis is accepted. Results are same irrespective of the gender.

Graph 6:



Requirements based on Aesthetic score

Table 8: Frequencies Statistics

		OI	DHC	AC
N	Valid	200	200	200
	Missing	0	0	0
Mean		6.135	3.495	5.550
Std. Error of Mean		.1732	.0723	.1072
Median		6.300	4.000	5.000
Mode		7.2	4.0	5.0
Std. Deviation		2.4496	1.0224	1.5162
Range		14.5	4.0	8.0
Minimum		.5	1.0	2.0
Maximum		15.0	5.0	10.0
Percentiles	25	4.625	3.000	4.000
	50	6.300	4.000	5.000
	75	7.300	4.000	6.750

Graph 7: Explore

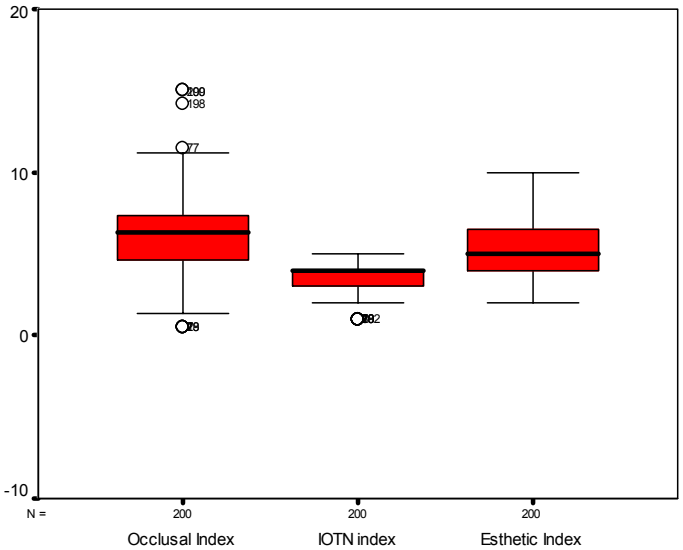
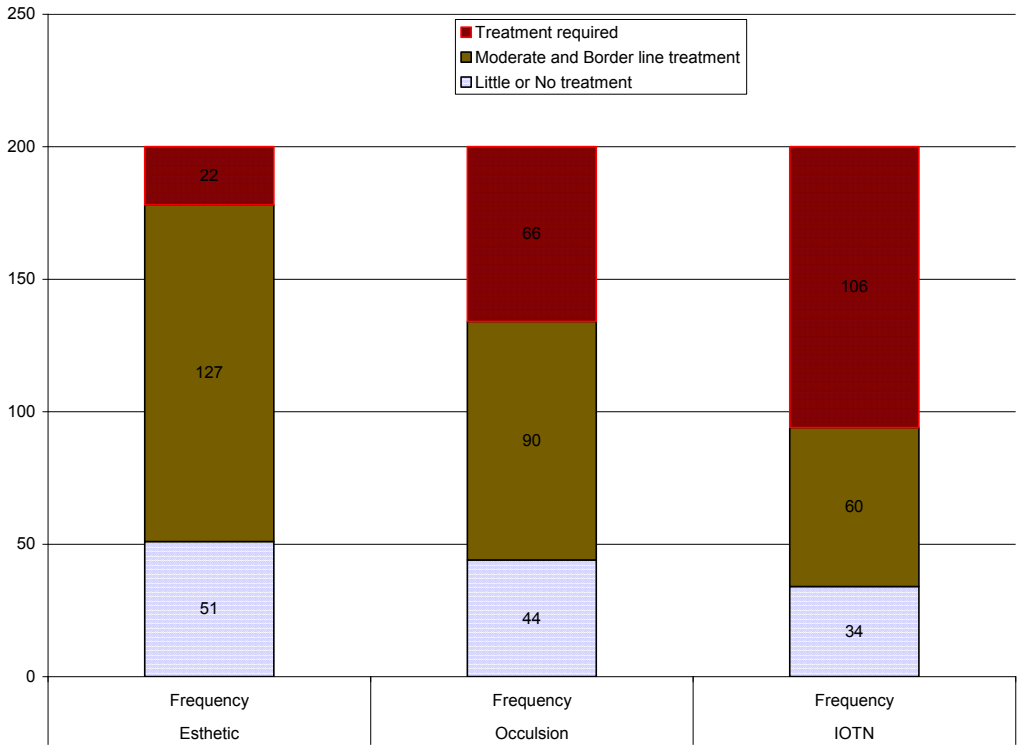


Table :9

	AC		OI		DHC	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Little or No treatment	51	25.5	44	22.0	34	17.0
Moderate and Border line treatment	127	63.5	90	45.0	60	30.0
Treatment required	22	11.0	66	33.0	106	53.0
Total	200	100.0	200	100.0	200	100.0

Graph :8



Nonparametric Correlations

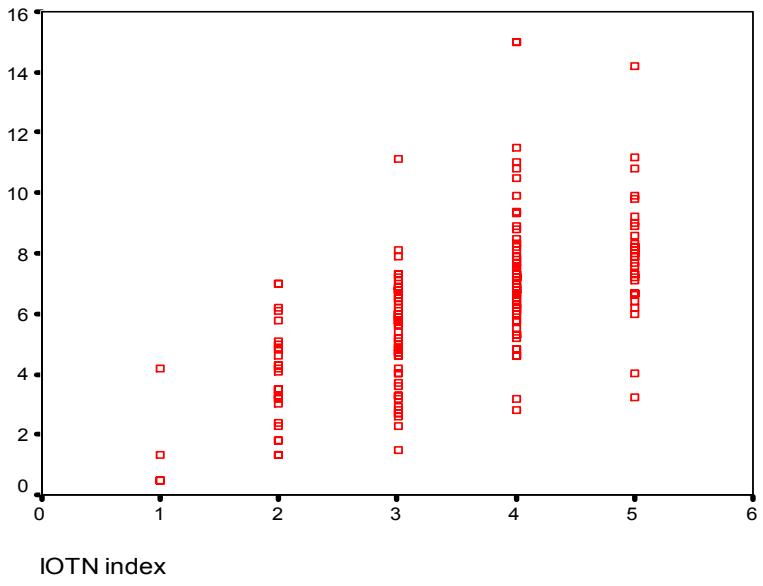
Since sig values are less than 0.05, null hypotheses rejected for all pair of variables. There is a significant and moderate level correlation exists.

Table 10: Spearman's rho Correlations

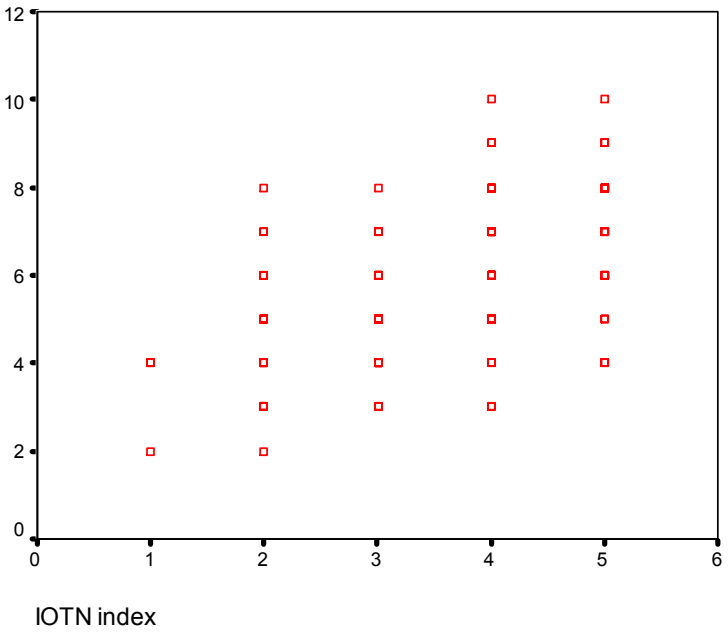
		OI	DHC	AC
OI	Correlation Coefficient	1.000	.657(**)	.424(**)
	Sig. (2-tailed)	.	.000	.000
	N	200	200	200
DHC	Correlation Coefficient	.657(**)	1.000	.554(**)
	Sig. (2-tailed)	.000	.	.000
	N	200	200	200
AC	Correlation Coefficient	.424(**)	.554(**)	1.000
	Sig. (2-tailed)	.000	.000	.
	N	200	200	200

** Correlation is significant at the 0.01 level (2-tailed).

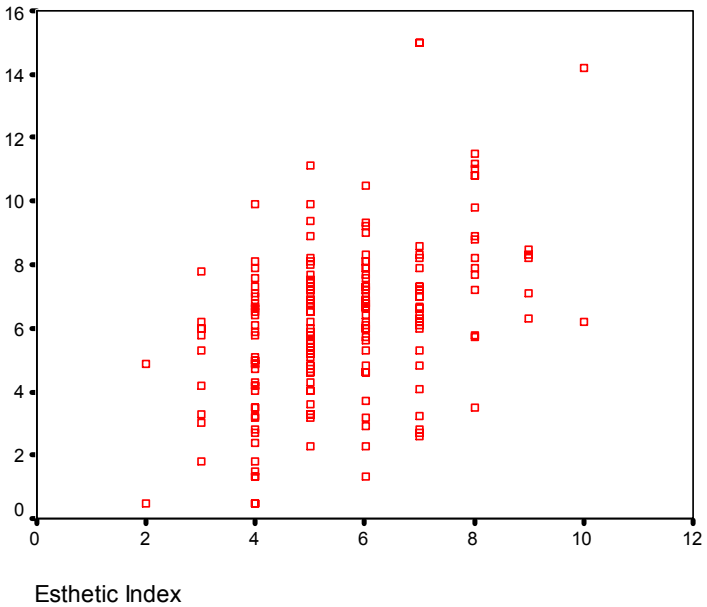
Graph 9:



Graph 10:



Graph 11:



Cohen's Kappa statistic for Inter rater agreement reliability

Table 11: Requirements based on OI * Requirements based on DHC Index

			Requirements based on DHC Index			Total
			Little or No treatment	Moderate and Border line treatment	Treatment required	
Requirements based on OI	Little or No treatment	Count	24	16	4	44
		% of Total	12.0%	8.0%	2.0%	22.0%
	Moderate and Border line treatment	Count	10	37	43	90
		% of Total	5.0%	18.5%	21.5%	45.0%
	Treatment required	Count	0	7	59	66
		% of Total	.0%	3.5%	29.5%	33.0%
Total		Count	34	60	106	200

Table 12: Symmetric Measures

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Measure of Agreement	Kappa	.387	.051	7.958	.000
N of Valid Cases		200			

a Not assuming the null hypothesis.

b Using the asymptotic standard error assuming the null hypothesis.

Statistical significance only states how precisely we have measured the magnitude. It makes no claim on how important is the magnitude in a given application or what is considered as high or low agreement.

Landis and Koch characterized values < 0 as indicating no agreement and 0–.20 as slight, .21–.40 as fair, .41–.60 as moderate, .61–.80 as substantial, and .81–1 as almost perfect agreement. Therefore it is a fair agreement between the OI and DHC in our study.

Table 13: Requirements based on AC * Requirements based on DHC

			Requirements based on DHC			Total
			Little or No treatment	Moderate and Border line treatment	Treatment required	
Requirements based on AC	Little or No treatment	Count	23	19	9	51
		% of Total	11.5%	9.5%	4.5%	25.5%
	Moderate and Border line treatment	Count	10	40	77	127
		% of Total	5.0%	20.0%	38.5%	63.5%
	Treatment required	Count	1	1	20	22
		% of Total	.5%	.5%	10.0%	11.0%
Total		Count	34	60	106	200
		% of Total	17.0%	30.0%	53.0%	100.0%

Table 14: Symmetric Measures

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Measure of Agreement	Kappa	.174	.043	4.584	.000
N of Valid Cases		200			

a Not assuming the null hypothesis.

b Using the asymptotic standard error assuming the null hypothesis.

Therefore it is a slight agreement between the DHC and AC in our study.

Table 15: Requirements based on AC * Requirements based on OI

			Requirements based on OI			Total
			Little or No treatment	Moderate and Border line treatment	Treatment required	
Requirements based on AC	Little or No treatment	Count	23	21	7	51
		% of Total	11.5%	10.5%	3.5%	25.5%
	Moderate and Border line treatment	Count	20	65	42	127
		% of Total	10.0%	32.5%	21.0%	63.5%
	Treatment required	Count	1	4	17	22
		% of Total	.5%	2.0%	8.5%	11.0%
Total		Count	44	90	66	200
		% of Total	22.0%	45.0%	33.0%	100.0%

Table 16: Symmetric Measures

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Measure of Agreement	Kappa	.236	.053	5.059	.000
N of Valid Cases		200			

a Not assuming the null hypothesis.

b Using the asymptotic standard error assuming the null hypothesis.

Therefore it is a fair agreement between the OI and AC in our study.

The evaluation of severity and treatment need were carried out successfully in this study for all the 200 samples. The questionnaire was easy to understand after amendments from the pilot trial were made.

Due to the convenient location of our dental college and good co-operation of the Participants, we were able to carry out a re-examination of 10% participants on the next day. The re-examination on another day called off the memory on the first examination of the examiner and allowed a good assessment of intra-examiner agreement. As we had a good intra-examiner agreement, this study showed a good validity of occlusion assessment by examiner with calibration. Initially, many studies on the prevalence of malocclusion used Caucasians as target populations[27,88]. More recently, several studies described the prevalence of malocclusion for Asians and they reported that the Asian population had a higher proportion of malocclusion[85].

A systematic review using explicit methods of literature searching and appraisal is recommended as the most appropriate approach to identify the best available evidence from past literatures[17]. Prior to this study there was no published systematic articles to know the severity and treatment need in Coimbatore population. This is the first time that we have been able to apply the theories learned in the discipline of Public Health (including epidemiology and statistical skills) into a Coimbatore population that could serve the community as a whole.

The study was randomly carried out on all the 200 samples to assess the severity and treatment need. The results we found that the severity of malocclusion was not normally distributed in our population.

The distribution with respect to males and females for severity & treatment need has been studied by several researchers. In 1994 Burden et al[13]. Hedayati et al[37], found that significantly more males than females were in the need for orthodontic treatment. Whereas there was more need for treatment among females in Mandall et al[55] study. In our study, the difference between the IOTN, OI values of boys and girls were not statistically significant. It is interesting to note that this result is in line with the results in Mourad et al[60],Ucuncu et al[90], Hosseinzadeh et al[41], and Ugur et al[91,] indicating that malocclusion samples were equally distributed for severity & treatment need.

Our study found that the orthodontic treatment demand of young adults were mainly influenced by the desire of improvement in appearance rather than of chewing, function or speech, and these findings agreed with other studies on various ethnic populations[86,89,71].

Although it has been suggested that females have a higher demand for orthodontic Treatment[25,36], our study found no significant difference between males and females on this issue; there was also no significant difference between them in the proportion of respondents that have received orthodontic treatment. However, we found that a significantly higher proportion of female young adults who came to our department.

The distribution of DHC grades has been studied by several researchers. Brook and Shaw[5] found that, the DHC proportions in 333 school children being 11-12 years old were 32.7% great treatment need,35.1% for no need or little treatment need. Hosseinzadeh et al[41], they found 45.7%of 17 year old students in Abade were found definite need of orthodontic treatment using DHC. So and Tang[85] examined 100 dental students in university of Hong Kong and the result was 52% great treatment need.

Gurey et al[35]., examined 483 Turkish primary school students in a low socio-economic region. The result was 72.26% need treatment,27.74% no or little treatment needed. Ugur et al[91] study resulted in 59.62% great treatment needed.Firestone[26] et al study resulted in 81.6% treatment needed for 95 referred patients who were 12 years old. Neslihan Ucuncu[90] in their study they found that 83.2% treatment needed in referred population.

In our study according to DHC, 83% of the sample population in the category of treatment needed. The results what we had from our study better correlates with the previous studies.

In our study IOTN-AC suggested a lower prevalence of orthodontic treatment need compared to IOTN-DHC &OI. This result is consistent with findings from other studies which have also reported a low prevalence of orthodontic treatment need in communities where IOTN-AC has been employed to prescribe orthodontic need[13,90,1]. The low level of great treatment needed in our study well correlates with the professional assessment of treatment need in Senegalese[68] school children with the AC of the IOTN, resulted only 8.7%of the sample as being definite need of orthodontic treatment. These

results are comparable to those reported in other African surveys using the IOTN. For instance, Otuyemi et al[63] and Mugonzibwa et al[62] found 7% and 11% of Nigerian and Tanzanian children in definite need of orthodontic treatment on the basis of the AC component.

A possible reason as to why the IOTN-AC index prescribes a lower prevalence of orthodontic treatment need than other occlusal indices may relate to the fact that it reflects subjective aesthetic judgments as distinct from anatomical trait assessment[4]. Furthermore, It is not uncommon that a lower than expected prevalence of orthodontic treatment need is prescribed when IOTN-AC is adopted to determine orthodontic treatment need as there is considerable debate about the appropriateness of the cut-off points for the index in prescribing treatment need[56,42]. On the other hand, a greater rate of AC grade 8-10 has been reported for other racial groups. The individual percentages of AC for no need to great treatment found by Brook and Shaw[12], Richmond et al[70], Burden and Holmes[13],Neslihan ucuncu[90] their findings were not close to our results.

In our study we found 22% of the sample under no need of treatment,and the remaining sample need treatment according to OI ,which moderately correlates with Tangs[86] study.

We found moderate level of correlation between OI& IOTN –DHC, the results well correlates with So and Tangs comparative study[86]. In previous studies several researchers like So and Tang[86],Tarvit et al[87], Jen Soh et al[45], Mhd et al[59], found that there was a poor correlation between DHC &AC, and our results were close to their findings.

But Neslihan ucuncu[90], Abu Alhaija et al[2]., they got perfect agreement between DHC &AC in their studies.

Tang et al[86], done a correlation of orthodontic treatment demand with treatment need assessed using IOTN &OI indices and concluded that OI assessment correlates better than IOTN with individuals perceptions of their own appearance(AC), and the treatment need judged by the OI correlates better with treatment demand, the same result appeared in our study.

Although the results of this study could not be directly applied to the community at large, it did provide sufficient information to justify the need for future studies on orthodontic treatment need in large samples to be conducted within the population. The high level of definite objective treatment need based on dental health issues despite the readily available Orthodontic care within the community from which the sample was derived warrants further assessment and evaluation of the provision and utilization of orthodontic care in the community.

In this study two commonly used and conceptually different measures of indices were used in assessing the severity and treatment need on Coimbatore population. This study appears to be the first study to examine the impact of malocclusion and its treatment need on patients who reported to our Orthodontic department.

1. In our study, the Coimbatore population showed 17% requires no need of treatment, 30% requires moderate need of treatment and 53% requires greater need of treatment when DHC of IOTN was used.
2. On the other hand, the Aesthetic component showed 25.5% showed no need of treatment, 63.5% moderate level of treatment needed and the great need of treatment was about only 11%.
3. When OI was used, our study population showed 22%no need of treatment, 45% requires moderate need of treatment and the great need treatment was about 33%.
4. The study shows, the prevalence for severity of malocclusion was assessed and found to be equally distributed with no gender differences.
5. In the present study, the OI correlated better with objective assessment of IOTN - DHC and subjective opinion of IOTN-AC. Between DHC & AC of IOTN there was poor correlation.
6. We found poor correlation between objective and subjective assessment for both severity & treatment need with in DHC & AC of IOTN, indicating that the need for treatment differs from patients perspective.
7. The need for orthodontic treatment was higher and most of the samples were in the category of moderate to great treatment needed, which is almost equal to the percentage values found by Brook and Shaw and It would be useful to replicate this study in other settings to support or refute our present findings.

To conclude, the present study done on Coimbatore population indicated a high prevalence of malocclusion in terms of severity & treatment need. The study also established a reliable base line data regarding prevalence, distribution and severity of malocclusion to meet the treatment needs in our population .In India with a vast ethnic and cultural heritage, where there is a wide range of prevalence of malocclusion, further epidemiological studies of this nature is needed to analyze the demand for orthodontic treatment.

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